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SCIENTIFIC WORTHIES

XI.—Sir Joseph Dalton Hooker

SIR JOSEPH DALTON HOOKER,[1] Director of the Royal Gardens, Kew, and President of the Royal Society--the second and only surviving son of the late Sir William Jackson Hooker, who first made the name illustrious in botany—was born at Halesworth, in Suffolk, on June 30, 1817. He was educated at the University of Glasgow, where the father was Regius Professor of Botany from 1820 to 1840, and where the son took the degree of M.D. in 1839. He has since been affiliated to the great English Universities, receiving in the same year the honorary degrees of D.C.L. at Oxford, and of LL.D. at Cambridge, and subsequently that of LL.D. at his own University of Glasgow. Immediately on completing his medical studies, namely in 1839, he was commissioned Assistant-Surgeon in the Royal Navy, and appointed botanist of the antarctic voyage of exploration by the *Erebus* and *Terror*, under the command of Captain, afterwards Sir James Clark Ross. This celebrated expedition, leaving England in the autumn of 1839, and touching at Madeira, Teneriffe, Cape Verde Islands, St. Helena, and the Cape of Good Hope, entered, in the spring of 1840, upon its special work of antarctic exploration, which, including visits to Kerguelen Island, New Zealand, Australia, Fuegia, and the Falkland Islands, occupied the ensuing three years, years of severe labour and much hardship, but of opportunities such as probably never before fell to the lot of a young naturalist, or were ever turned to better account.

The botanical fruits of this expedition are mainly garnered in the "Flora Antarctica," the "Flora Novæ Zelandiæ," and the "Flora Tasmanica," six quarto volumes, the last of which appeared in the year 1860. These do not contain mere reports of explorations, with descriptions of whatever was novel or of peculiar interest, but are systematically elaborated and complete floras, in which all that had been gathered from every source is incorporated. The excellent analyses of the plants, and in particular those of the cryptogams, are for the most part from the author's own drawings, many of them made during the progress of the voyage.

During the preparation of the first of this series of floras, Sir J. D. (then Dr.) Hooker, being then attached to the Geological Survey of Great Britain, brought out several important papers upon points in fossil botany. They need not be here particularly enumerated, but they attracted much attention, and evinced remarkable aptitude for dealing with a difficult class of questions.

In the interval between the publication of the second volume of the "Flora Antarctica," in 1847, and the first volume of the "Flora Novæ Zealandiæ," in 1853, Sir J. D. Hooker, aided by Government, but mainly on his private resources, accomplished his botanical mission to India. A general account of this undertaking is given in his "Himalayan Journals; or, Notes of a Naturalist in Bengal, the Sikkim and Nepal Himalayas, the Khasia Mountains," &c., in two volumes, 8vo., 1854.

His journey occupied three and a half years, and was not without hardship and adventure. After spending two seasons in exploring geographically and botanically the loftiest Himalayan mountains and valleys, unaccompanied by any European, he was, when on the Tibetan frontier, joined by his friend, Dr. Campbell, the political agent resident in a neighbouring British province; this led to the capture of both by the Rajah of Sikkim, and they were imprisoned for some weeks, during which time they were treated with great indignity and their lives were threatened. During his journey in Sikkim he made a survey of the whole country and the bordering districts of Nepal, from the plains of India to Tibet; this was published by the Trigonometrical Survey Office of Calcutta, and is still the standard map of the country. It is a curious fact that though nearly thirty years have elapsed since Sir J. D. Hooker was in the country, many of the trans-Himalayan passes which he then discovered and measured have not since been visited by any other traveller.

Of the scientific results, the first fruits were given to the world in various papers communicated to the Asiatic Society of Bengal; these were followed by the "Rhododendrons of the Sikkim Himalayas," a folio, with splendid illustrations from the author's own pencil; and in a volume of the "Flora Indica," by himself and his friend and schoolmate, Dr. Thomas Thomson. A series of papers upon certain groups, or discussing special points, followed later; and at length the systematic elaboration of Indian botany has been hopefully renewed, and the "Flora of British India," upon the model of the "British Colonial Floras," has reached the second volume. Although "assisted by other botanists," some of the ablest of these died before their contributions were completed, and a large part of the labour and responsibility has devolved upon Sir J. D. Hooker.

In 1869 Sir J. D. Hooker held the presidency of the British Association at Norwich. In his address he advocated the recognition of the Darwinian hypothesis as the best means of advancing the study of the natural sciences, and dwelt at length on the subject of provincial museums, showing by what means they can be rendered both instructive to the general public and be adapted to the needs of scientific men.

On an earlier occasion, at the meeting of the Association at Nottingham in 1866, he was selected to give one of the two public lectures that form part of the programme at these annual meetings. Choosing "Insular Floras" for his subject he gave the results of his own wide personal experience in a discourse which attracted much attention on account of the soundness of the views he advocated and the originality of the illustrations by which he supported them.

Of special memoirs, such as test a botanist's capabilities, four of Sir J. D. Hooker's are particularly noteworthy. These are, in the order of publication; first, the essay "On the Structure and Affinities of Balanophoreæ," a peculiar and puzzling group of phænogamous root-parasites, here for the first time well investigated upon sufficient material, admirably illustrated, and their affinities acutely discerned. The second is a shorter paper "On the Origin and Development of the Pitchers of Nepenthes," prefacing an account, with striking illustrations, of some new Bornean species, and bringing out the conclusion that the pitcher is a modification of a gland at the apex of the midrib of a leaf. The functions and mode of action of these pitchers became the subject of a later investigation and the theme of his address to the Section of Zoology and Botany, over which he presided, at the meeting of the British Association at Belfast, in 1874. This forms one of the earlier contributions to our new knowledge of carnivorous plants. Thirdly, the "Outlines of the Distribution of Arctic Plants," cognate with which is the elaborate "Introductory Essay to the Flora Tasmanica," published earlier in the same year, 1860. These two papers embody the results of long and wide study of the geographical distribution, systematic association, and various degrees of relationship of existing species, in regard to their probable history and origin. Having been prepared before Mr. Darwin's "Origin of Species" appeared, they are among the earliest and most notable contributions to this part of our science. They are endeavours to test the practical value in systematic botany of now familiar theoretical considerations or hypotheses, the influence of which was felt and the importance dimly divined, in advance of their full development by Mr. Darwin. Fourthly, a rare opportunity was well improved when that most extraordinary of plants, *Welwitschia mirabilis*, of Western Tropical Africa, was placed in Sir J. D. Hooker's hands for study. Later investigations of completer materials may have since cleared up points which were left doubtful, and may have definitely answered questions which were placed on the way to settlement by being suggestively raised. Still the splendid memoir on "Welwitschia, a New Genus of Gnetaceæ," stands unrivalled among botanical monographs of the kind for perfection of illustration, elucidation of structure, and insight into affinities.

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[1] Since these lines were written her Majesty has signified her appreciation of Dr. Hooker's services, especially those in relation to the Indian Empire, by conferring upon him the honour of Knight Commander of the Star of India.—A. G.

Turning next to labours which came in great part by inheritance, we need only refer to the thirteen volumes of the *Botanical Magazine* which follow the thirty-seven edited by Sir William Hooker, and to the two volumes in continuation of the less popular, but botanically important, "Icones Plantarum." Then, after the exhaustion of Sir William Hooker's "British Flora" in its eighth edition, Sir J. D. Hooker replaced it by his own compendious "Student's Flora of the British Islands, 1870," which is now passing to a revised edition. Those who have made the attempt well know how the conscientious preparation of such a work tasks the best powers of a botanist. Upon the presentation, in an English dress, of Le Maout and Decaisne's "Traité Général de Botanique," in a translation by the late Mrs. Hooker, the orders were re-arranged and annotated by Sir J. D. Hooker, and a chapter on the principles of classification and a synopsis of natural groups added. Then, least in size, but not in usefulness nor in difficulty of execution, comes the "Primer of Botany," for the use of young beginners. As far as possible, elementary treatises should be written by masters in science, and Sir J. D. Hooker has contributed his fair share.

We come, at length, to the "Genera Plantarum ad examplaria imprimis in Herbariis Kewensibus servata definita." In this, one of the most arduous and, as we judge, most important botanical works of our time, Sir J. D. Hooker is associated with the veteran Bentham, who has the enviable advantage of being able to devote all his time to botanical investigation, undistracted by professorial or administrative cares, and who brings to the work the largest experience, the surest judgment, and the most indomitable industry—gifts and accomplishments rarely thus associated. As two of the three compact volumes of the "Genera Plantarum" are already published, and the third is in progress, let us hope that we may all ere long see and rejoice together over the completion of a work which marks an epoch in systematic botany. Compilations and digests we may have, as we have had; and supplements and new editions of the present work may naturally and easily be provided; but, as its only real predecessors are the "Genera Plantarum" of Linnæus (1737-64) and of Jussieu (1789)—to which we may add that of Endlicher (1836-40) the latter a wonderful monument of literary labour and bibliographical ability, directed by a fair amount of botanical knowledge—so we may expect that a long generation will pass before an undertaking like the present will be again attempted and carried through.

If this cursory reference to the publications of one who is still, as we fondly hope, only in mid-career, were extended into details and specifications, it would still be far from giving a full idea of the extent and value of Sir J. D. Hooker's scientific services. While his colleague, to whom reference has been made, supplies a notable instance of what may be accomplished by one who (without declining a reasonable share of public duty) has been mainly free from engrossing administrative cares, the life of Sir J. D. Hooker, like that of his father, has fallen in the common lot of scientific men. Or rather, in both the Hookers, unusual gifts and energies have entailed more than ordinary cares and responsibilities. To develop and to sustain and extend such noble and invaluable establishments as those at Kew Gardens was a duty not to be declined, however engrossing. It has been performed in such wise as to win, along with national applause, the gratitude of the scientific world. Throughout his travels and voyages his energies were directed by his father to the advancement of Kew as a centre of scientific botany, and as a means of transmitting to all parts of the world plants useful to mankind. In 1855 he was appointed Assistant-Director, and since the death of his venerated father, in 1865, the burden of maintaining the Gardens at the high condition they had attained through the father's exertions has fallen on the son.

Botanists all over the world count this devotion to Kew Gardens high among Sir J. D. Hooker's scientific services. They admired and cheered the courageous and indomitable spirit with which he resisted and thwarted the attempt of a whilom official guardian to lower the character and diminish the scientific value of this most useful establishment. They rejoice, likewise, to see the presidential chair at the Royal Society occupied for the second time by a botanist and explorer. They concede the paramount claims of public duty, yet not without a shade o jealousy and regret; for administration is time-consuming and endless, while Hookers and their like are few, and botanical work on every side is pressing.

A critical exposition and estimate of the work which Sir

J. D. Hooker has already accomplished, and by which his high scientific position has been earned, must needs be either too technical or too long for a sketch like this. Moreover, the Atlantic is no longer what it once was, when a judgment wafted across it either way was invested with somewhat of the character of the verdict of posterity. And the close relations for forty years of the present writer with the Hookers, father and son, disqualify him for the office of judge. Let that duty devolve upon our successors.

The knowledge and experience of most of our eminent botanists have been gained, and their work mainly done, in the herbarium and botanic garden. No living botanist that we know of has shared Sir J. D. Hooker's opportunities of studying in place the living vegetation of so many parts of the world; these include, besides those already mentioned as places visited during his Antarctic voyage, the southern shores of Europe, North Africa, Palestine, and India to the Chinese borders. When we have welcomed him to New England, as we hope to do before these lines are in print, and when he has traversed our continent from the Atlantic to the Pacific, it may confidently be affirmed that he has seen far more βοτάνη than ever fell to the lot of any other of his craft.

Sir J. D. Hooker was elected President of the Royal Society in 1873, an office which he still holds.

May, 1877 ASA GRAY

NOTES ON THE BOTANY OF THE ROCKY MOUNTAINS

[The contemplated visit to the United States of America alluded to in the preceding article has now been accomplished, and Sir Joseph Hooker has favoured us with the notes of his journey following.]

IN company with Dr. Asa Gray, Professor of Botany of Harvard University, Cambridge, U.S., I availed myself of an oft-repeated invitation to us both from Dr. Hayden, the distinguished chief of the Topographical and Geological Survey of the United States Territories, to join the Survey in Colorado and Utah; this we did with the view of instituting a comparison between the floras of these central and elevated territories and those of other parts of the continent, and thus obtaining some insight into the origin and distribution of the North American flora. In order to comprehend the importance of Colorado and Utah as the basis for such investigations, I should state that they occupy a very central position in the continent, and include a section of the Rocky Mountains about 300 miles long and about as broad, namely, from N. lat. 37° to 41°, and from W. long. 105° to 112°.

The mountain region thus limited consists of extensive and often level floored valleys, sometimes many miles broad, and elevated 4,000 to 5,000 feet above the sea, called "parks" in local topography, which are interposed between innumerable rocky mountain ridges of very various geological age and formation, which often reach 12,000 feet, and sometimes 14,000 feet elevation, the maximum being under 14,500.

Those of the so-called parks which are watered by rivers that flow to the east are continuous with the prairies that lie along the eastern flanks of the Rocky Mountains; those watered by rivers that flow to the west are continuous with the so-called desert or salt regions that lie along the western flanks of the range; but the divides between the head waters of the streams that flow either way are often low, and the botanical features of the east and west may hence meet and mix in one park.

Such a section of the Rocky Mountains must hence contain representatives of three very distinct American floras, each characteristic of immense areas of the continent. There are two temperate and two cold or mountain floras, viz.: (1) a prairie flora derived from the eastward; (2) a so-called desert and saline flora derived from the west; (3) a sub-alpine; and (4) an alpine flora; the two latter of widely different origin, and in one sense proper to the Rocky Mountain ranges.

The principal American regions with which the comparison will have first to be instituted are four. Two of these are in a broad sense humid; one, that of the Atlantic coast, and which extends thence west to the Mississippi river, including the forested shores of that river's western affluents; the other that of the Pacific side, from the Sierra Nevada to the western ocean: and two inland, that of the northern part of the continent extending to the Polar regions, and that of the southern part extending through New Mexico to the Cordillera of Mexico proper.

The first and second (Atlantic plus Mississippi and the Pacific) regions are traversed by meridional chains of mountains approximately parallel to the Rocky Mountains; namely, on the Atlantic side by the various systems often included under the general term Appalachian, which extend from Maine to Georgia, and on the Pacific side by the Sierra Nevada, which bounds California on the east. The third and fourth of the regions present a continuation of the Rocky Mountains of Colorado and Utah, flanked for a certain distance by an eastern prairie flora extending from the British possessions to Texas, and a western desert or saline flora, extending from the Snake River to Arizona and Mexico. Thus the Colorado and Utah floras might be expected to contain representatives of all the various vegetations of North America except the small tropical region of Florida, which is confined to the extreme south-east of the Continent.

The most singular botanical feature of North America is unquestionably the marked contrast between its two humid floras, namely, those of the Atlantic plus Mississippi, and the Pacific one; this has been ably illustrated and discussed by Dr. Gray in various communications to the American Academy of Sciences, and elsewhere, and he has further largely traced the peculiarities of each to their source, thus laying the foundations for all future researches into the botanical geography of North America; but the relations of the dry intermediate region either to these or to the floras of other countries had not been similarly treated, and this we hope that we have now materials for discussing.

Our course and direction in America was directly westward to Colorado, where we followed the eastern flanks of the Rocky Mountains for about 300 miles, that is from Denver in the north, to near the borders of New Mexico, ascending the highest northern and southern peaks, and visiting several intermediate parks and valleys, watered by tributaries of the Arkansas, Platte, Colorado, and Rio Grande. From Denver we proceeded north